

Unconsolidated Aquifer Systems of Shelby County, Indiana

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Eight unconsolidated aquifer systems have been mapped in Shelby County: the Dissected Till and Residuum; the Till Veneer; the New Castle Till; the New Castle Till Subsystem; the New Castle Complex; the Buried Valley; the White River and Tributaries Outwash; and the White River and Tributaries Outwash Subsystem. The first system includes relatively thin deposits left by continental ice sheets as well as eroded residuum (a product of bedrock weathering). The next seven systems comprise sediments deposited by, or resulting from, glaciers, glacial meltwaters, and post-glacial precipitation events. Boundaries of these aquifer systems are commonly gradational and individual aquifers may extend across aquifer system boundaries.

The thickness of unconsolidated sediments in Shelby County is quite variable. In much of the southeastern part of the county, unconsolidated materials are less than 30 feet thick and bedrock is exposed in places along the Flatrock River. Elsewhere in Shelby County, unconsolidated deposits are commonly greater than 60 feet thick. Sediments overlying bedrock are thickest in the southwestern part of the county near the town of Mount Auburn, where sequences of till and outwash have been stacked above a broad buried bedrock valley.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably from local reality. Variations within geologic environments can cause variation in susceptibility to surface contamination. In addition, man-made structures such as poorly constructed water wells, unplugged or improperly abandoned wells, and open excavations can provide contaminant pathways that bypass the naturally protective clays.

Dissected Till and Residuum Aquifer System / Till Veneer Aquifer System

In Shelby County, the Dissected Till and Residuum Aquifer System and the Till Veneer Aquifer System are mapped as one system because they are similar in composition and in aquifer characteristics. As in counties to the south, the Dissected Till and Residuum Aquifer System includes areas where pre-Wisconsin or Wisconsin till is thin and dissected due to deep down-cutting by streams and in places areas where soils have formed directly from bedrock due to weathering. Also included in this aquifer system are relatively thin deposits of alluvium and colluvium in many stream valleys. The Till Veneer Aquifer System encompasses areas where the unconsolidated material is predominantly thin till overlying bedrock. In these areas this thin till is chiefly the product of the deposition of Wisconsin glacial till over an uneven, eroded bedrock surface rather than erosion of till by younger streams. Together, the Dissected Till and Residuum Aquifer System and the Till Veneer Aquifer System have the most limited ground-water resources of the unconsolidated aquifer systems in the county.

There is little potential for ground water production in the Dissected Till and Residuum Aquifer System or the Till Veneer Aquifer System in Shelby County. Only about 10 percent of reported wells penetrating these aquifer systems are completed in unconsolidated materials rather than the underlying bedrock. The total thickness of these systems typically ranges from about 15 to 45 feet and wells are commonly completed at depths of 30 to 45 feet. Where present, sand and gravel units are commonly less than 3 feet thick. Because of the generally low permeability of the near-surface materials, these systems are not very susceptible to contamination from surface sources.

New Castle Till Aquifer System

The New Castle Till Aquifer System is mapped mostly in the central and southeastern portions of Shelby County, where intertill sand and gravel layers are typically thinner than in the western and northern parts of the county. Unconsolidated deposits range in thickness from about 40 feet to more than 100 feet (where glacial deposits have filled bedrock valleys). Potential aquifer materials include outwash sands and/or gravels that typically range from 4 to 15 feet thick and are generally overlain by 30 to 50 feet of till.

This system is capable of meeting the needs of domestic and some high-capacity users. Wells are generally 40 to 65 feet deep. Domestic well capacities are typically 10 to 20 gallons per minute (gpm) and static water levels are commonly 10 to 25 feet below surface. High-capacity users (4 facilities, 10 wells) report yields of 30 to 250 gpm for individual wells.

The New Castle Till Aquifer System has a low susceptibility to surface contamination because intratill sand and gravel units are generally separated from the surface by till layers within the system.

New Castle Till Aquifer Subsystem

Areas where unconsolidated materials generally exceed 50 feet in thickness, yet have little aquifer potential, are mapped as New Castle Till Aquifer Subsystem in Shelby County. Wells completed in this system in Shelby County are typically 35 feet to 50 feet deep. Potential aquifer materials include thin, intratill sand and gravel deposits that are typically less than 7 feet thick. Where present, aquifer materials are capped by till that is generally 30 to 60 feet thick.

This system is capable of meeting the needs of some domestic users. However, about 70 percent of wells constructed in the area mapped as New Castle Till Aquifer Subsystem in this county bypass the unconsolidated materials and utilize the underlying bedrock aquifer.

The New Castle Till Aquifer Subsystem is generally not very susceptible to surface contamination because its intratill sand and gravel units are overlain by thick till deposits.

New Castle Complex Aquifer System

The New Castle Complex Aquifer System is mapped in a large portion of northern Shelby County. This system also includes much of the upland area between the Big Blue River and Sugar Creek in the west-central part of the county. The New Castle Complex Aquifer System is characterized by unconsolidated deposits that are quite variable in materials and thickness. Sand and gravel aquifer deposits vary from thin to massive and are typically overlain by a thick till. In places, this system also exhibits alternating layers of outwash and till of variable thickness. This system is typically 65 to 120 feet thick in Shelby County. However, the total thickness of this system exceeds 200 feet in places where small bedrock valleys are buried by the thick till and outwash deposits. The most notable of these filled bedrock valleys trends westward from the Rush County line toward Morristown. Because of the availability of shallower aquifers, few wells in this area utilize the deeper unconsolidated aquifers.

This system is capable of meeting the needs of domestic and some high-capacity users in Shelby County. Outwash aquifer materials in the New Castle Complex are typically 10 to 25 feet thick and are overlain by a till cap which is commonly 30 to 60 feet thick. Wells in this system are typically completed at depths of 50 to 85 feet. Domestic well capacities are commonly 10 to 25 gpm and static water levels are generally 10 to 30 feet below surface. There are 12 registered significant water withdrawal facilities (24 wells) utilizing this system and individual wells produce from 80 to 1000 gpm.

The New Castle Complex Aquifer System is not very susceptible to contamination where thick clay materials overlie. However, in some areas where outwash is present at or near the surface and clay deposits are thin, the system is at moderate to high risk.

Buried Valley Aquifer System

The Buried Valley Aquifer System consists of aquifer materials deposited in pre-glacial bedrock valleys. During valley development, bedrock was eroded to create valleys that were subsequently filled with unconsolidated sediment. Although there are additional buried bedrock valleys in Shelby County, only the larger buried valleys that contain significant aquifer materials have been included as mapped units of the Buried Valley Aquifer System.

This system is mapped in southwestern Shelby County where a broad valley, which cuts as deeply as 130 feet into Silurian and Devonian bedrock, was filled with outwash materials and subsequently capped by glacial drift. This drift consists of alternating till layers and intertill sand and gravel units of varying thickness. In the uplands near the town of Mount Auburn, this cap reaches a maximum thickness of about 250 feet. The Buried Valley Aquifer System extends southward about 1 mile into Bartholomew County, where the cap thins considerably. Beneath the drift lies thick outwash sand and gravel that is connected laterally to near-surface outwash that fills the modern stream valleys of the Big Blue River to the west and the Flatrock River to the east. Total thickness of unconsolidated deposits ranges from about 100 feet (near the Bartholomew County line) to over 350 feet (near Mount Auburn).

The Buried Valley Aquifer System has the potential to meet the needs of domestic and some high-capacity users. Domestic wells commonly utilize the discontinuous intertill sand and gravel units. These wells are typically completed at depths of 70 to 150 feet and static water levels are commonly 25 to 100 feet below surface. Well yields are typically 10 to 20 gpm. Only 1 registered significant water withdrawal facility uses this aquifer system in Shelby County. The 2 wells in this facility utilize the basal outwash and have reported yields of 800 and 1000 gpm.

Because thick till deposits overlie the aquifer units and inhibit the downward migration of contaminants the Buried Valley Aquifer System is generally not very susceptible to surface contamination. The susceptibility is greater in areas where the clay deposits are thin and directly overlie outwash deposits.

White River and Tributaries Outwash Aquifer System

The White River and Tributaries Outwash Aquifer System is mapped in western and northern Shelby County along portions of the Flatrock River, Big Blue River, Sugar Creek, Brandywine Creek, and Snail Creek. This aquifer system contains large volumes of outwash and alluvial deposits that filled the river valleys of the White River and its major tributaries. As the glaciers melted, the quantity of sediment was too large for the streams to transport. As a result, the increased sediment load was stored in the valleys as vertical and lateral accretionary deposits. As long as the retreating glaciers continued to provide sediment in quantities too large for the streams to transport, the main valley continued to be filled. These deposits formed the most prolific aquifer system in the county.

Although unconsolidated deposits in this system are typically 60 to 100 feet thick in Shelby County, their total thickness exceeds 130 feet in places. Wells are commonly completed at depths of 40 to 70 feet. Aquifer materials include predominantly sand and gravel deposits that are typically 20 to 40 feet thick. In some areas clay or silt overlie the aquifer materials. Where present, this fine-grained cap is typically 10 to 25 feet thick.

This system has the greatest potential of any aquifer system in Shelby County and can meet the needs of domestic and high-capacity users. Domestic well yields commonly range from 10 to 25 gpm and static water levels are generally 10 to 30 feet below surface. There are 12 registered significant water withdrawal facilities (18 wells) utilizing the White River and Tributaries Outwash Aquifer System in this county. High-capacity wells in this system have been tested at rates ranging from 600 to 1200 gpm.

In areas that lack overlying clays, this aquifer system is highly susceptible to contamination from surface sources. Where the aquifer system is overlain by clay or silt deposits, the aquifer is moderately susceptible to surface contamination.

White River and Tributaries Outwash Aquifer Subsystem

The White River and Tributaries Outwash Aquifer Subsystem is mapped along portions of the Flatrock River and Slash Creek in the southwestern part of Shelby County and also in a small area just north of Morristown in the floodplain of the Big Blue River at the Hancock County line.

Total thickness of unconsolidated deposits overlying bedrock ranges from about 50 to 100 feet. Few wells utilizing this system in Shelby County have been reported. However, in neighboring Johnson and Bartholomew Counties, the White River and Tributaries Aquifer Subsystem has the potential to meet the needs of domestic and some high-capacity users. Domestic well yields are typically 10 to 25 gpm with static water levels 10 to 20 feet below surface. In Johnson and Bartholomew Counties, three high-capacity facilities utilize this aquifer system with reported capacities from 100 to 1000 gpm. Thus, it is expected that the White River and Tributaries Aquifer Subsystem also has similar aquifer characteristics and comparable ground-water potential in Shelby County.

Areas within this aquifer system that have overlying clay or silt deposits are moderately susceptible to surface contamination; whereas, areas that lack overlying clay or silt deposits are highly susceptible to contamination.

Registered Significant Ground-water Withdrawal Facilities

There are 29 registered significant ground-water withdrawal facilities (total of 54 wells) using unconsolidated aquifers in the county. Most of these facilities utilize the White River and Tributaries Aquifer System (12 facilities, 18 wells) or the New Castle Complex Aquifer System (12 facilities, 24 wells). However, several facilities use the New Castle Till Aquifer System (4 facilities, 10 wells) and the Buried Valley Aquifer System (1 facility, 2 wells). Dominant uses for these facilities are irrigation and public supply. Refer to Table 1 for some details on the wells and to the map for facility locations.

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